Spot Safety Project Evaluation

Project Log # 200512147

Spot Safety Project # 07-98-222

Spot Safety Project Evaluation of the Fully Actuated Traffic Signal Installation At the Intersection of SR 1355 / Harvey Rd and SR 1144 / River Rd – SR 1352 / Oakland Rd Guilford County

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Traffic Engineering and Safety Systems Branch
North Carolina Department of Transportation

Principal Investigator

_____ 03-02-2006
Majed S Bazzari, EI Date

Traffic Safety Project Engineer

Reviewed By:

_____ _____
Carrie L Simpson, EI

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 07-98-222 - The Intersection of SR 1355 / Harvey Rd and SR 1144 / River Rd – SR 1352 / Oakland Rd in Guilford County.

Introduction

In an attempt to assess the safety of our roads, the Safety Evaluation Group of the Traffic Safety Systems Management Section has evaluated the above project. The methodologies used in this evaluation offer various philosophies and ideas, in an effort to provide objective countermeasure crash reduction results. A naive before and after analysis and an Odds Ratio comparison analysis has been completed to measure the effectiveness of the spot safety improvement. This information is provided to you so the benefit or lack of benefit for this type of project can be recognized and utilized for future projects.

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of a fully actuated traffic signal. The improvement was requested by a private citizen. Prior to the improvement, the intersection was controlled by a flashing traffic signal and stop signs located on SR 1144 and SR 1352. SR 1355, SR 1144, and SR 1352 are all two-lane facilities at the treatment intersection. SR 1352 has an exclusive right turn lane at the treatment intersection. A yield sign exists on SR 1352 for the right-turn movement. The speed limit on SR 1144 and SR 1352 are 45 mph and 35 mph, respectively. The southwest leg of SR 1355 has a speed limit of 45 mph, and the northeast leg has a speed limit of 40 mph. The problem statement in the *Project Justification Sheet* was that traffic volumes at this intersection had increased to the point where motorists could not safely maneuver through the intersection.

The initial crash analysis for this location was completed from April 1, 1995 through March 31, 1998 with a total of twenty-three accidents. There were nineteen Angle crashes, one Left Turn crash, and one Right Turn crash that were deemed correctable by the project improvement. Two class-A injuries, eight class-B injuries and nine class-C injuries resulted from these crashes. The completion date for the improvement was on December 15, 1999 at an estimated total cost of $30,000.00.

Naïve Before and After Analysis

After reviewing the spot safety project file folder along with all the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period was from November 1, 1999 through January 31, 2000. The before period consisted of reported crashes from March 1, 1994 through October 31, 1999 (5 Years, 8 Months) and the after period consisted of reported crashes from February 1, 2000 through September 30, 2005 (5 Years, 8 Months). The ending date for this analysis was determined by the available crash data at the time the crash analysis was completed.

The analysis also consisted of two different sets of data, the treatment and the comparison data. The treatment data consisted of all crashes within 150 feet of the subject intersection. The comparison data consisted of all crashes within a 150 feet Y-line of SR 1355 / Harvey Rd from SR 1480 (MP 0.0) to SR 1113 (MP 2.87). The following data tables depict the Naive Before and After Analysis for the treatment and comparison locations. Please note that Frontal Impact Crashes were the target crashes for the applied countermeasure. The Frontal Impact Crash types considered are as follows: Left turn, same roadway; Left turn, different roadways; Right turn, same roadway; Right turn, different roadways; Head on; and Angle.

Crash Data Summary:

Treatment Information			
	Before	**After**	**Percent Reduction (-) / Percent Increase (+)**
Total Crashes	57	17	-70.2
Total Severity Index	7.0	5.4	-23.6
Frontal Impact Crashes	55	10	-81.8
Frontal Severity Index	7.2	6.2	-14.4
Volume	5500	6400	16.4
Comparison Strip Information			
	Before	**After**	**Percent Reduction (-) / Percent Increase (+)**
Total Crashes	120	93	-22.5
Total Severity Index	7.0	5.9	-16.3
Frontal Impact Crashes	89	29	-67.4
Frontal Severity Index	8.0	3.8	-52.3
Volume	8000	10000	25.0
Odds Ratio: Treatment versus Comparison			
	Before	**After**	**Percent Reduction (-) / Percent Increase (+)**
Treatment Total Crashes	57	17	**-61.5**
Comparison Total Crashes	120	93	
Treatment F.I. Crashes	55	10	**-44.2**
Comparison F.I. Crashes	89	29	

Treatment Data Summary:

	Before Period	After Period	Percent Reduction (-) / Percent Increase (+)
Total Crashes	**57**	**17**	**-70.2**
Fatal Crashes	0	0	N/A
Non Fatal Injury Crashes	37	10	-73.0
Total Injury Crashes	37	10	-73.0
PDO Crashes	20	7	-65.0
Night Crashes	5	3	-40.0
Wet Crashes	6	2	-66.7
Alcohol/ Drug Crashes	2	0	-100.0
Fatal Injuries	0	0	N/A
Class A	2	0	-100.0
Class B	24	5	-79.2
Class C	38	12	-68.4
Non-Fatal Injuries	64	17	-73.4
Total Injuries	64	17	-73.4
Total Target Crashes	**55**	**10**	**-81.8**
Fatal Crashes	0	0	N/A
Non Fatal Injury Crashes	37	7	-81.1
Total Injury Crashes	37	7	-81.1
PDO Crashes	18	3	-83.3
Night Crashes	5	2	-60.0
Wet Crashes	6	1	-83.3
Alcohol/ Drug Crashes	2	0	-100.0
Fatal Injuries	0	0	N/A
Class A	2	0	-100.0
Class B	24	5	-79.2
Class C	38	9	-76.3
Non-Fatal Injuries	64	14	-78.1
Total Injuries	64	14	-78.1

The naive before and after analysis at the treatment location resulted in a 70.2 percent decrease in Total Crashes, a 23.6 percent decrease in the Total Severity Index, an 81.8 percent decrease in Target Crashes, a 14.4 percent decrease in the Target Severity Index, and a 16.4 percent increase in Average Daily Traffic (ADT). The comparison locations experienced a 22.5 percent decrease in Total Crashes, a 16.3 percent decrease in the Total Severity Index, a 67.4 percent decrease in Target crashes, a 52.3 percent decrease in the Target Severity Index, and a 25.0 percent increase in ADT. The before period ADT year was 1996 and the after period ADT year was 2002.

The Odds Ratio is used as another means of calculating the treatment effect. The number of crashes in the before and after period from the comparison strip is used to calculate the percent reduction in crashes for the Treatment Intersection. As shown in the previous table, using the Odds Ratio calculation, there is a 61.5 percent decrease in Total Treatment Intersection crashes and a 44.2 percent decrease in Target Treatment Intersection crashes from the before to the after period.

Results and Discussion

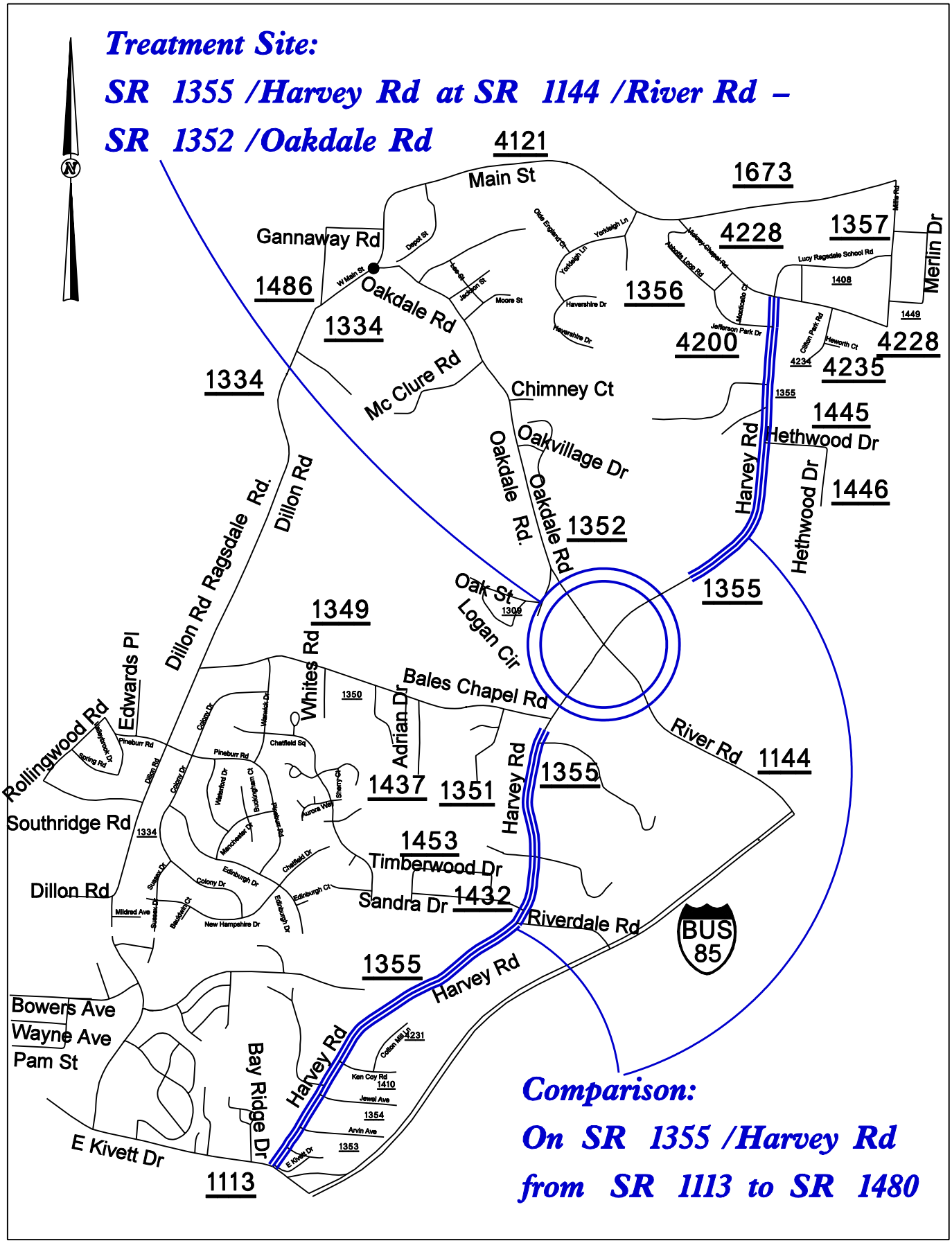
The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 70.2 percent decrease in Total Crashes and an 81.8 percent decrease in Frontal Impact Crashes. Using the Odds Ratio to calculate the treatment effect resulted in a 61.5 percent decrease in Total Crashes and a 44.2 percent decrease in Frontal Impact crashes at the Treatment Intersection. The summary results above demonstrate that the treatment location appears to have had a substantial decrease in the number of Total Crashes and Frontal Impact Crashes from the before to the after period using both analysis methods.

Further analysis of crash types at the Treatment Intersection reveals that the number of Angle crashes decreased (by 86.7 percent) from 45 crashes in the before period to 6 crashes in the after period. The number of Rear-End crashes increased (by 400.0 percent) from 1 crash in the before period to 5 crashes in the after period. As previously mentioned in the problem statement, the traffic volumes near the treatment location have been steadily increasing. The increase in traffic volumes may be attributed to several residential developments in the area, especially along SR 1352 / Oakdale Rd. *Please see attached photos and collision diagrams.*

As the Safety Evaluation Group completes additional spot safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors.

Evaluation of Spot Safety Project Number 07–98–222

Location Map, Guilford County



location map.dgn 05/02/2006 04:17:40 PM

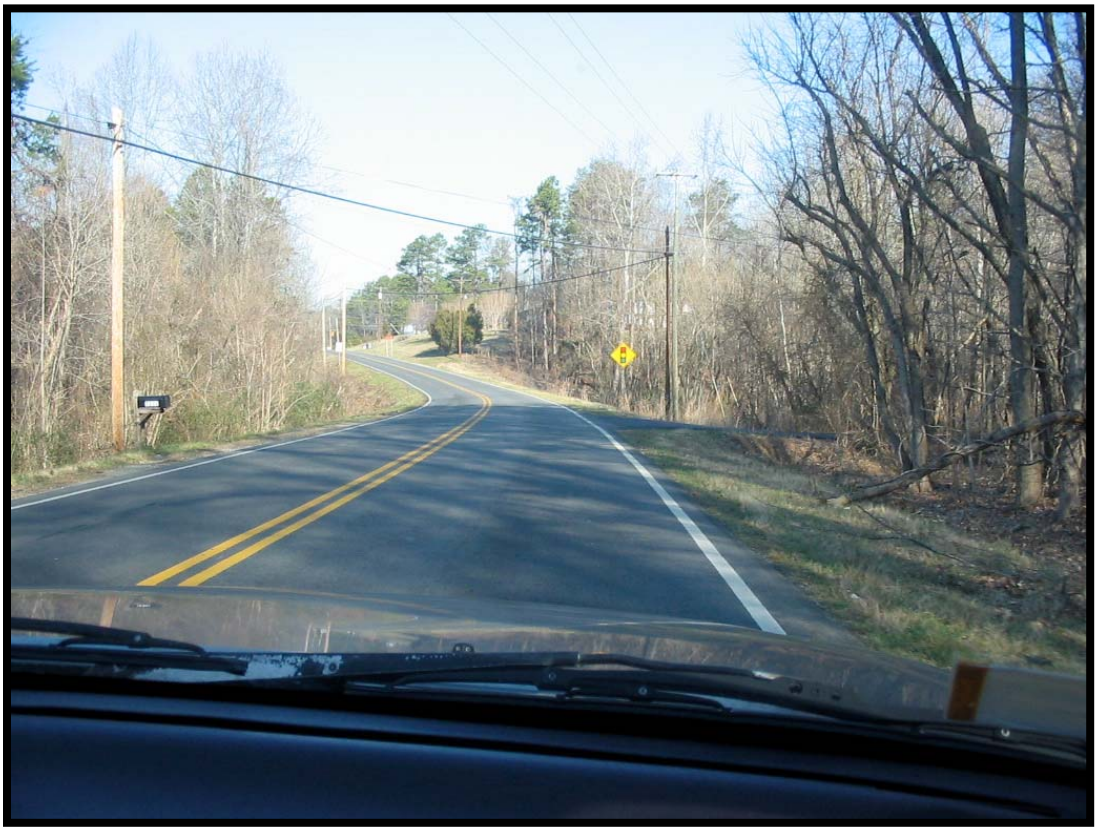
Treatment Site Photos Taken on February 9, 2006

Travelling South West on SR 1355 / Harvey Rd

Travelling South West on SR 1355 / Harvey Rd

Travelling North East on SR 1355 / Harvey Rd

Travelling North East on SR 1355 / Harvey Rd



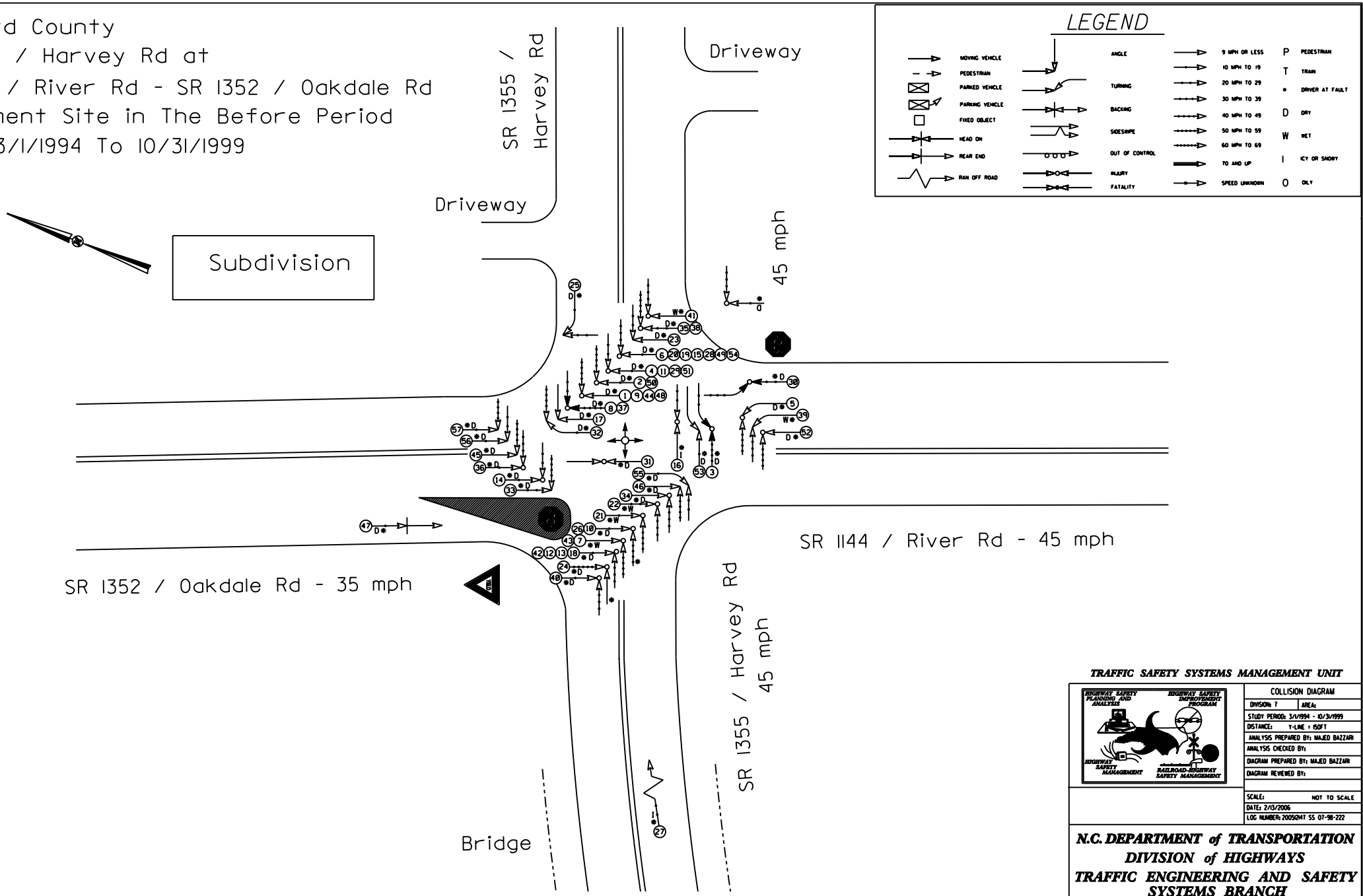
Travelling North West on SR 1144 / River Rd

Travelling North West on SR 1144 / River Rd

Travelling South East on SR 1352 / Oakdale Rd

Travelling South East on SR 1352 / Oakdale Rd

Guilford County
SR 1355 / Harvey Rd at
SR 1144 / River Rd - SR 1352 / Oakdale Rd
Treatment Site in The Before Period
From 3/1/1994 To 10/31/1999



LEGEND

MOVING VEHICLE
PEDESTRIAN
PARKED VEHICLE
PARKING VEHICLE
FIXED OBJECT
HEAD ON
REAR END
RAN OFF ROAD

ANGLE
TURNING
BACKING
SIDESWIPE
OUT OF CONTROL
INJURY
FATALITY

9 MPH OR LESS
10 MPH TO 19
20 MPH TO 29
30 MPH TO 39
40 MPH TO 49
50 MPH TO 59
60 MPH TO 69
70 AND UP
SPEED UNKNOWN

P PEDESTRIAN
T TRAIN
* DRIVER AT FAULT
D DRY
W WET
I ICY OR SNOWY
O OILY

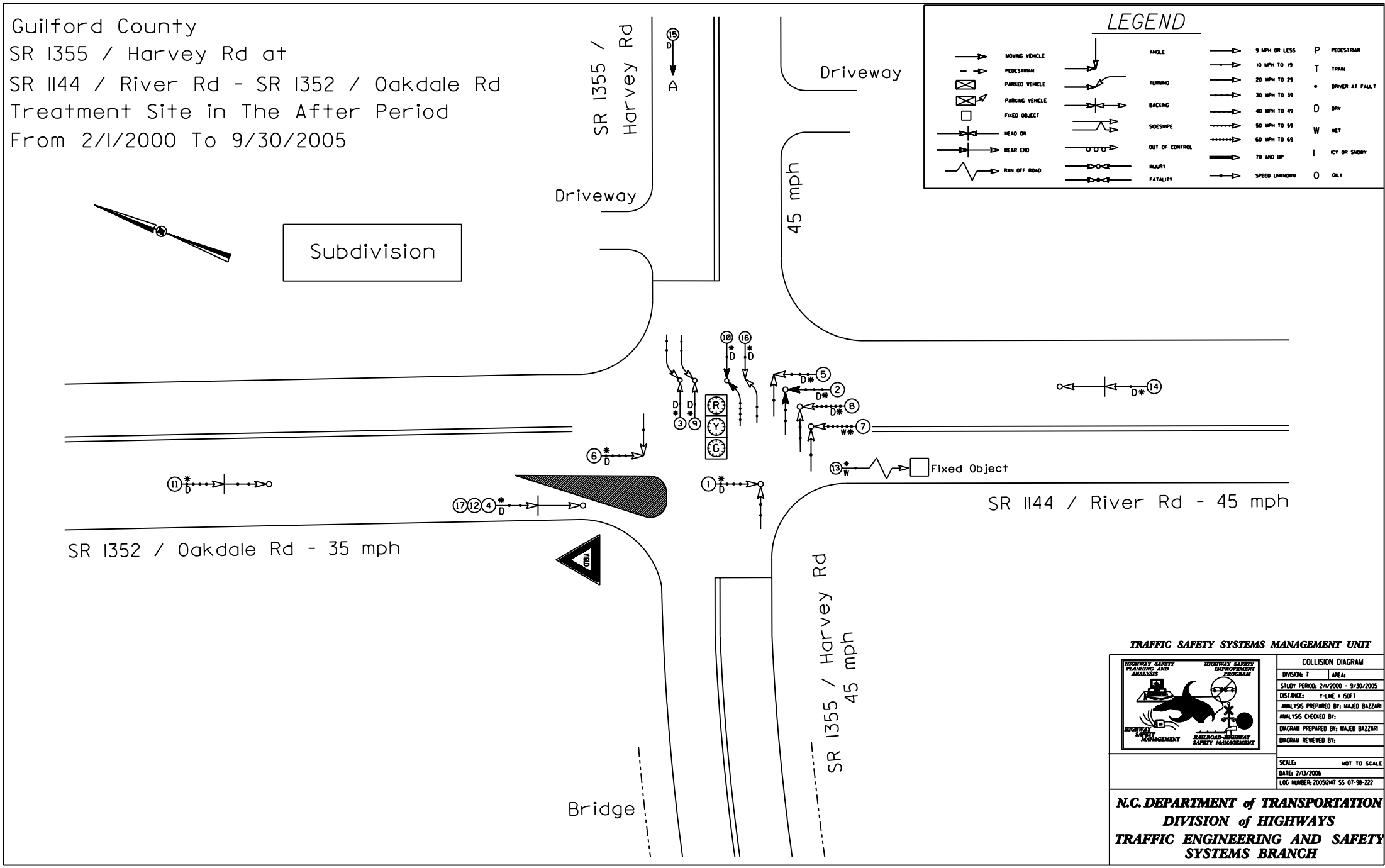
TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

HIGHWAY SAFETY PLANNING AND ANALYSIS
HIGHWAY SAFETY IMPROVEMENT PROGRAM
HIGHWAY SAFETY MANAGEMENT
RAILROAD-HIGHWAY SAFETY MANAGEMENT

COLLISION DIAGRAM
DIVISION: 7 AREA:
STUDY PERIOD: 3/1/1994 - 10/31/1999
DISTANCE: Y-LINE : 150FT
ANALYSIS PREPARED BY: MAJED BAZZARI
ANALYSIS CHECKED BY:
DIAGRAM PREPARED BY: MAJED BAZZARI
DIAGRAM REVIEWED BY:
SCALE: NOT TO SCALE
DATE: 2/13/2006
LOG NUMBER: 20052147 SS 07-98-222

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH

before.dgn 05/02/2006 04:29:56 PM



after.dgn 05/02/2006 04:40:03 PM